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THE BOEING COMPANY

CODE IDENT NO. 81205

NUMBER D2-30118

TITLE GROUND TEST MISSILE REQUIREMENTS (U)

MODEL NO. WS-133B CONTRACT NO. AF04(694)-266

ISSUE NO. 60 ISSUED TO ASTIA

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REV SYM A

VOL. NO. OF D2-30118

SECT. PAGE 1

U3 4287 9035 ORIG. 8/62

2-5142-2

ACTIVE PAGE RECORD

SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM	SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM
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SYM	DESCRIPTION	DATE	APPROVED
A	**Pages Revised:** 1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 24, 25, 26, 27, 28, 29, 34, 35, 36, & 37 **Page Added:** 29a **Pages Deleted:** 20, 21, 22, 23, 39, 40, 41, 42 Revision "A" was made in accordance with Letter MBSQAP-19-2-9S/C Humphrey/8821 Signed by A. P. Piccolo. Dated 19 Feb. 1963	3-21-3	W. Keenan 3/25/3

U3 4287 9025 ORIG. 8/62

REV SYM A

BOEING NO D2-30118

SECT. PAGE 3

REFERENCES

Reference	
1	BSD Exhibit 62-137, WS-133B General Test Plan
2	IA&T Letter Contract AFO(694)-266; WS-133B Statement of Work
3	D2-30000-4, WS-133B IA&T Management and Implementation Plan Wing VI Block Change
4	D2-6400, Vol. 2, Minuteman Schedule Control Document WS-133B
5	D2-14082, WS-133B Test Planning Outline
6	D2-30088, AMR Test Program Plan
7	D2-14132, VAFB Test Program Plan
8	D2-30019, AMR Functional Flow Analysis and Equipment Requirements
9	D2-30053, WS-133B Category I and Category II Test Program Functional Flow Analysis
10	D2-14399, Missile Design Requirements
11	D2-30031-2, Structural Design Criteria
12	D2-13306, Model Specification - Ground System and Ground to Missile Subsystems Integration - CTLI (S-133-2110)

When approved revisions are incorporated in the above documents subsequent to the latest approved issue of this document and the contents of these revisions are in conflict with information contained herein, it shall be assumed that this document is modified accordingly in the conflicting areas. Periodic revisions will be made to this document reflecting such modifications.

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1.0 INTRODUCTION

The purpose of this document is to state the Ground Test Missile Requirements for support of the WS-133B Program. These requirements include GTM quantities, configurations, utilization, schedules, and instrumentation. The contractual authorization for this document is stated in Task 6.6.1 of the Statement of Work (Reference 2).

Ground Test Missiles support test, assembly and checkout operations at the Atlantic Missile Range (AMR), Vandenberg Air Force Base (VAFB), USAF Plant 77, and Seattle. Detailed descriptions of these activities are contained in the General Test Plan (Reference 1) and the Test Planning Outline (Reference 5).

It is desirable to support the test objectives at AMR, VAFB and Seattle with a minimum number of ground test missiles. The test programs are described herein only in general terms since it is the purpose of the Test Program Plans and the Detailed Test Requirements documents for each major program to provide such specific information. The GTM quantities were derived from an analysis of the test planning and program scheduling accomplished to date. In the event that GTM requirements for operational bases are finalized, these will be added at a subsequent revision.

This document has been revised in compliance with the BSD approval letter of 19 February 1963. Contractual authorization to build GTM 062 and GTM 063 has not been received and reference to these missiles is incorporated for planning purposes only.

2.0 AMR GROUND TEST MISSILE USAGE

2.1 GTM 060 General

One Electronic Ground Test Missile (EGTM) will be required to support the HSM-80C Flight Test Program at AMR. It will be identified as GTM 060 and will be a functionally complete R&D Electronic Ground Test Missile, operationally identical to the flight test missiles in weight and physical configuration, except that engines and other pyrotechnics will be inert.

All tests supported by GTM 060 will be conducted entirely at the Atlantic Missile Range (AMR) beginning in March, 1964, and continuing throughout the HSM-80C AMR Flight Test Program. This GTM will be used during the compatibility tests of the AMR equipment, facilities and procedures prior to processing of the flight test missiles. It will be the first missile to be assembled at AMR in the HSM-80C configuration. GTM 060 will be cycled through the AMR Minuteman Complex from receiving and inspection through final countdown procedures in the same manner as will the first flight test missile. Hardware and procedural discrepancies will be corrected and the tests repeated until the equipment, facilities, and/or procedures are considered satisfactory for FTM processing.

For the remainder of the AMR Program, GTM 060 will be used to checkout modifications to equipment and for special test activities such as may be required after an abort launch. A usage schedule for GTM 060 is shown in Section 5.0.

2.2 GTM 060 Processing Sequence

Components of the HSM-80C configuration for GTM 060 will be shipped from each of the responsible Associate Contractors to AMR for missile assembly. Evaluation of Receiving and Inspection procedures and test equipment will be conducted during the GTM processing. The missile components and/or sections will then be transferred to MAB No. 1, which will have been modified to support assembly and checkout of the HSM-80C missiles. MAB activities will include evaluation of the:

a) Mating operations for revised missile components, less R/V

b) Compatibility of the missile components with the transportation and handling equipment

c) Functional checkout of the missile electronic subsystems

During the subsystem tests, missile hardware will be connected to the test equipment and the compatibility of this equipment will be verified. Functional tests will be performed to check

individual missile subsystems, instrumentation transducers, control system alignment, telemetry system, electrical interference and flight readiness.

From MAB No. 1 the GTM will be transported to MAB No. 3 where compatibility with weigh and balance equipment will be determined. Final assembly and sealing of the missile sections will be completed in this facility.

After completing MAB No. 1 and MAB No. 3 tests, the assembled GTM less the R/V, will be transferred to Launch Complex 31. Capability of the transportation and handling equipment to transport, handle and emplace the missile will be evaluated. The GTM will be used to verify that the launch area equipment, including the missile mount, and procedures are capable of satisfactorily processing an HSM-80C flight test missile through to launch. A reentry vehicle, simulating the Mark 12 configuration, will be supplied by the R/V Associate Contractor when necessary to complete the checkout procedures.

The GTM, less R/V, will then be transferred to MAB No. 2, where it will be disassembled to such an extent that will permit a repeat of the operations performed in MAB No. 1. After MAB No. 2 has been certified as satisfactory for processing HSM-80C flight test missiles, GTM 060 will be transferred to Launch Complex 32 to verify that it also is capable of processing HSM-80C flight test missiles.

3.0 VAFB GROUND TEST MISSILE USAGE

3.1 General GTM Usage

A total of two Ground Test Missiles are required at VAFB to support the WS-133B Test Program. The following test activities, supported by GTM's, will be accomplished during Assembly and Checkout, Category I, and Category II at VAFB. A

a) Demonstrations of Transportation and Handling (T&H) equipment and associated procedures, including that which is operational and that which is peculiar to VAFB

b) Assembly and Checkout of all operational facilities, equipment and procedures, e.g., Launch Facilities and Ground Electronic System

c) Electro-Interference Tests

d) Mechanical and Electrical Integration Tests

e) Prelaunch Checkout, Simulated Launches and Actual Launch Support

f) Validation and Verification of Procedures and Technical Orders

A Schedule showing the phasing for Ground Test Missiles at Vandenberg is shown in Section 5.0.

3.2 Tests Requiring GTM's

A GTM will be required for T&H support. Electronic GTM's will be installed in VAFB launch facilities for Assembly and Checkout, Electro-Interference Compliance Tests, Technical Order Validation and Verification, and Mechanical and Electrical Subsystem Tests, Prelaunch Checkout, and Launch Support. A

3.2.1 Transportation and Handling Demonstrations

For VAFB T&H Demonstrations, a GTM will be required with the mechanical form, fit, and weight characteristics of an operational HSM-80C missile. Missile handling and transportation equipment, peculiar to Vandenberg, will also be demonstrated to assure their satisfactory use with the flight test missiles. In addition, a Mechanical Fit Evaluation of the missile with the integrated CTLI/G&C sections will be accomplished using a GTM and production CTLI and G&C sections. Transportation and Handling procedures evaluated during the Seattle Test Program will be demonstrated with either the mechanical GTM or the electrical GTM's. A

3.2.2 Procedures Validation and Verification

Validation and Verification of Transportation and Handling, A&C/O, Maintenance, and Operational procedures must be accomplished on a timely basis to support operational usage. GTM's will be used for the majority of procedure validation and verification.

3.2.3 Assembly and Checkout

An EGTM will be installed in each of the launch facilities near the end of A&C/O for checkout and integration of the facilities. A&C/O effort will culminate in an EGTM Sustained Alert at each LF. This demonstration will satisfy the requirements for Air Force acceptance of the facilities. A

3.2.4 Electro-Interference Compliance Support

After A&C/O of the first two WS-133B launch facilities, an electronic GTM will be used for electro-interference testing. Single thread LF/LCF electro-interference demonstrations will be conducted with the EGTM; followed by an E-I demonstration of an interconnected, two LF/LCF complex with at least one EGTM installed. A

3.2.5 Mechanical and Electrical Subsystem Tests

The following subsystem and integration tests will be conducted using the Electronic GTM's and three Launch Facilities during the Cat I and Cat II Programs:

a) Launch Control Facility Evaluation Tests

b) Launch Facility Evaluation Tests

c) Integrated Launch Facility Tests with two or more LF's

d) Single Thread Tests

e) Missile Startup, Targeting and Alignment

f) Security Subsystem Tests

g) Environmental Control System Tests

h) Sustained Alert for extended period A

i) Multiple Targeting and Target Changing

j) End-to-End Check of CTLI Subsystem

3.2.6 Prelaunch Checkout and Launch Support

A prelaunch checkout and a simulated launch will be conducted before the first FTM launch and before subsequent launches, as required. A prelaunch checkout will also be performed after each refurbishment. Multiple-thread support to actual launches will be accomplished with standby LF's and EGTM's.

3.3 GTM Scheduled Usage

3.3.1 GTM 062 Usage

The tests requiring the use of Ground Test Missile (GTM) 062 will be conducted entirely at VAFB from September 1964 through August 1965. It will be delivered as an HSM-80C Electronic Ground Test Missile and will support the Integration, Electro-Interference, Acceptance, and Demonstration Tests discussed previously. GTM 062 will be the first electronic GTM available at VAFB. It will be assembled at Plant 77. A

3.3.2 GTM 063 Usage

The tests requiring the use of Ground Test Missile (GTM) 063 will be conducted entirely at VAFB from December 1964 through August 1965. It will be delivered as an HSM-80C Electronic Ground Test Missile and will support the Integration, Electro-Interference, Acceptance and Demonstration Tests discussed previously. GTM 063 will be assembled at Plant 77. A

4.0 SEATTLE GROUND TEST MISSILE USAGE

4.1 Transportation and Handling Tests

Tests requiring Ground Test Missile 065 will be conducted at the Boeing-Seattle Test Program facilities. The first usage for GTM 065 will be from February through July, 1964, as a Mechanical Ground Test Missile to conduct the following Transportation and Handling Tests:

a) TE Dynamic Test

b) Missile Emplacement and Removal

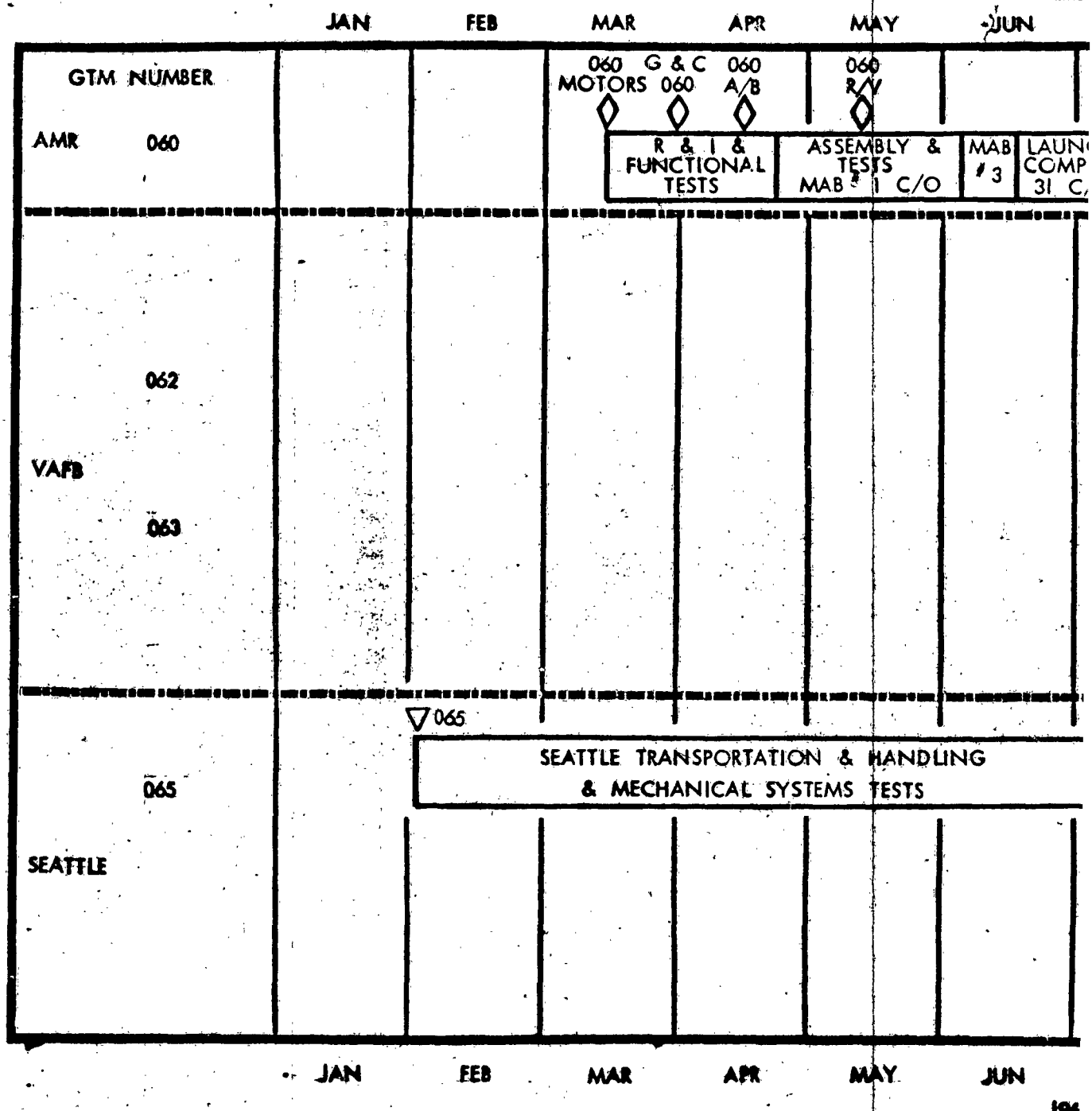
c) R/V - G&C Maintenance Van Evaluation

For these tests, the GTM will have the mechanical form, fit, and weight characteristics of an operational HSM-80C missile plus the instrumentation required to conduct the above tests. The rocket motors will be inert and pyrotechnics will not be installed. Electronic components will be mass simulated where such components may affect the above tests. The R&D instrumentation section will not be required for tests involving this GTM. Simulated reentry vehicle, penetration aids, retro-rockets, and guidance and control section will be required.

5.0 GROUND TEST MISSILE SCHEDULES

The scheduled usage of all WS-133B ground test missiles is shown in Table 5.1. The GTM assembly schedule is shown in Table 5.2. This latter table identifies each GTM as to type, place of assembly and usage, the date components are required, and the date the complete GTM is required on-dock at the test site.

The Ground Test Missile scheduled usage (Table 5.1) shown in this document is in accordance with the W/S 133B Minuteman Schedule Control Document (Reference 4).



196

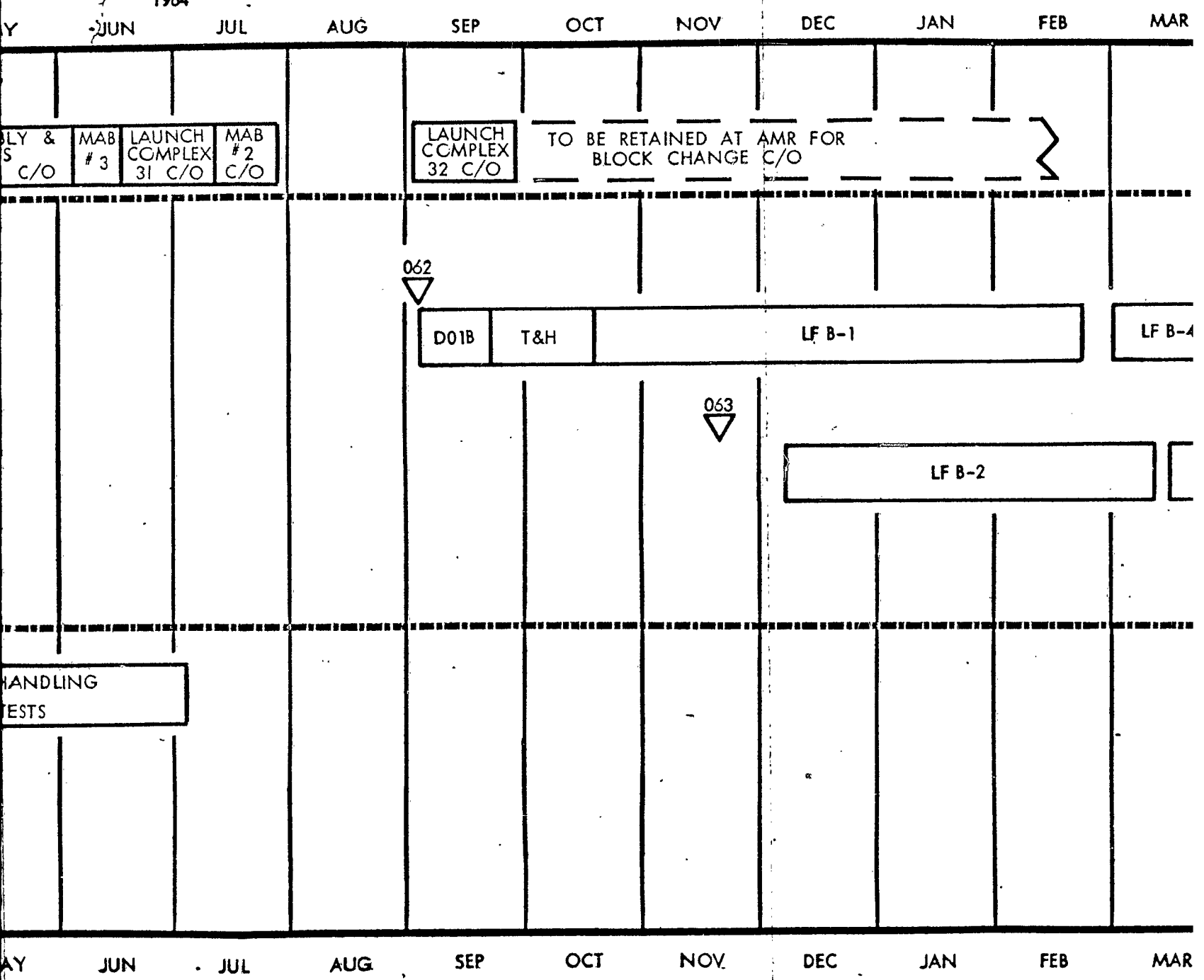
ON DOCK READY FOR TEST

◊ ON DOCK AMR CONTRACTOR R & I AREAS

NOTE: SCHEDULE REFERENCED TO D2-6400-2
M² SCHEDULE CONTROL DOCUMENT

TABLE 5.1

WS-133-B GROUND TEST MISSILE SCHEDULE



D01B DESTRUCT ORDNANCE INSTALLATION BUILDING CHECKOUT

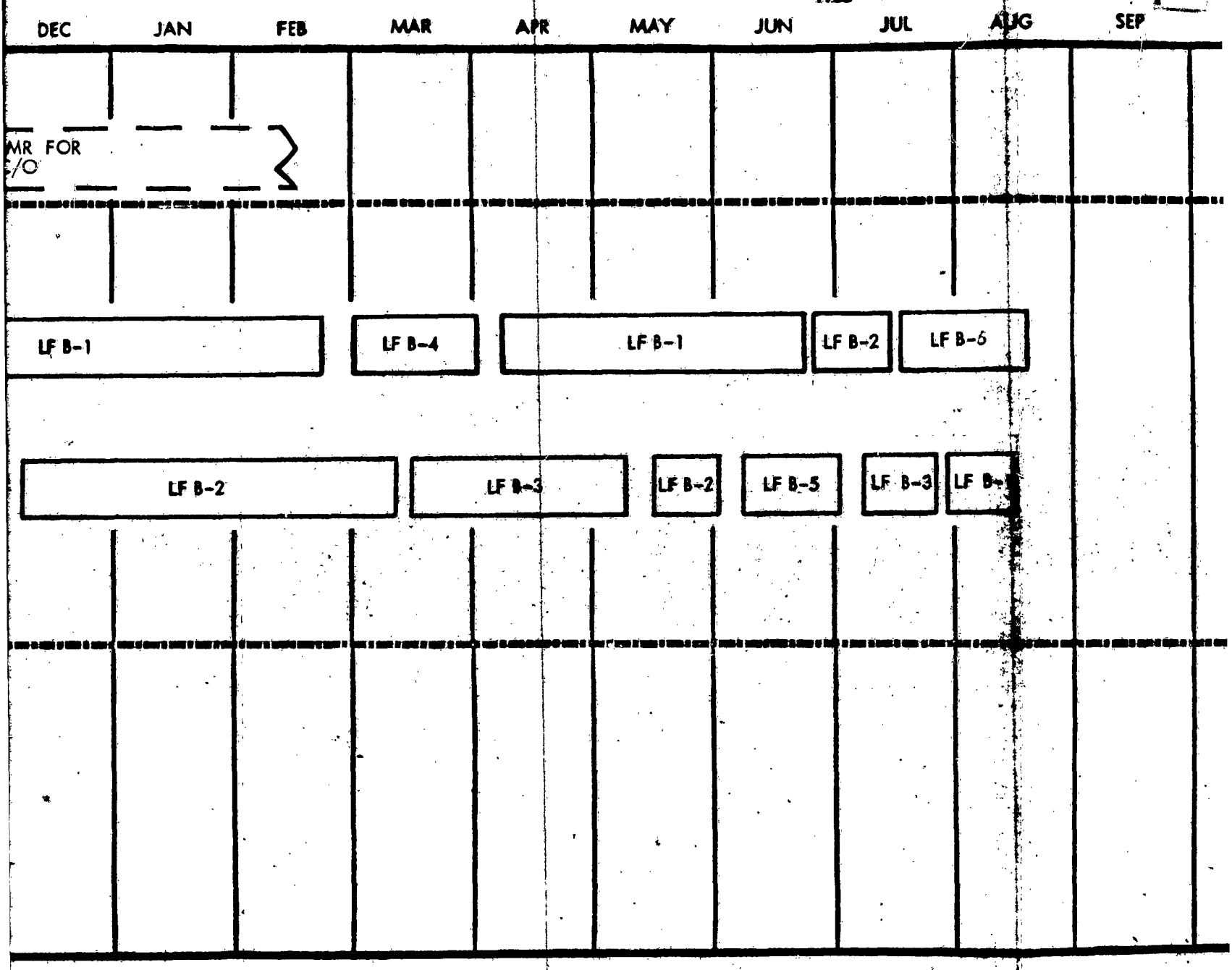
T & H TRANSPORTATION & HANDLING

LF LAUNCH FACILITY
WS 133 B SILOS B-1 THRU B-6

TABLE 5.1

GROUND TEST MISSILE SCHEDULE

3



LF LAUNCH FACILITY

WS 133 B SILOS B-1 THRU B-6

CALC			REVISED	
CHECK				
APPR				
APPR				

TABL

WS-133B

MISSI

BOEING

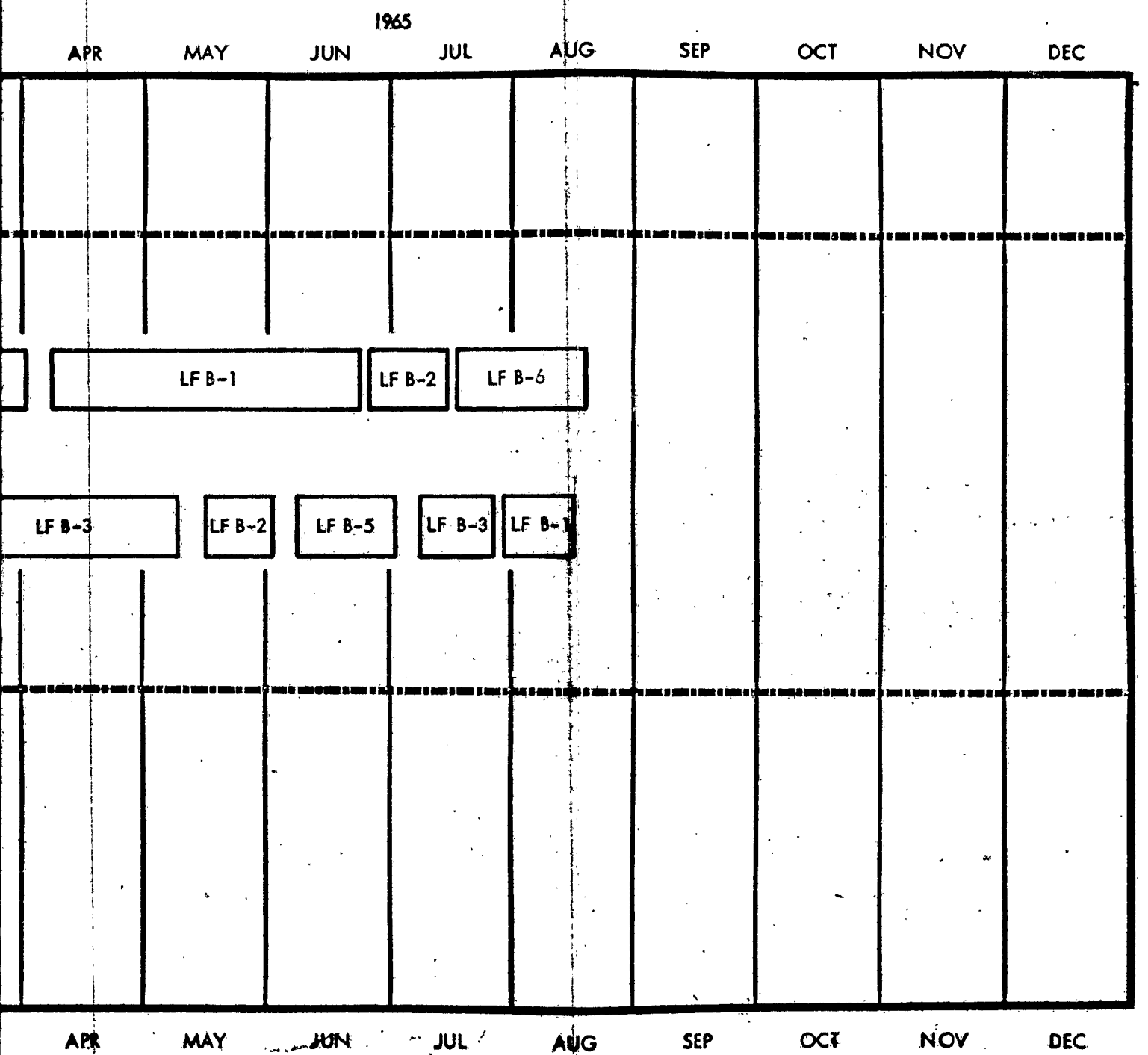


TABLE 5.1

CALC			REVISED	DATE	WS-133B GROUND TEST MISSILE SCHEDULE
CHECK					
APPR					D2-30118
APPR					BOEING AIRPLANE COMPANY SEATTLE, WASHINGTON
					PAGE 14

A

Table 5.2

WS-133B GROUND TEST MISSILE ASSEMBLY SCHEDULE

GTM NO.	DESCRIPTION	CONFIGURATION	ASSY AT	COMPONENTS ON DOCK ▷3	USED AT	GTM ASSY ON DOCK ▷3
060	R&D Electronic	R&D	AMR	3-18-64	AMR	6-17-64
062	Electronic RCD	Operational	AFP 77	7-23-64	VAFB	9-3-64
063	Electronic RCD	Operational	AFP 77	10-7-64	VAFB	11-17-64
065	Mechanical - Instrumented	Operational	Seattle	12-3-63	Seattle	2-3-64

Note 1: RCD = Repetitive Countdown

Note 2: Electronic GTM's include Mechanical FTM characteristics

Note 3: Refer to D2-6400II for source

6.0 AMR GROUND TEST MISSILE CONFIGURATION

6.1 GTM 060 Detail Configuration

GTM 060 is the R&D Ground Test Missile for use at AMR. The configuration of GTM 060 is based upon an HSM-80 configuration. Details of the GTM configuration are as follows:

6.1.1 Section 41 - The Re-Entry Vehicle shall duplicate the first flight unit except for inert ordnance. Ordnance simulators shall be provided with the inert ordnance.

6.1.2 Section 42 and Downstage Guidance and Control Components - The Guidance and Control System to be used for GTM 060 shall be the same as flight hardware. A new model G&C section with associated cables, batteries and NCU's (for first and third stages only) will be provided. A new electronic control unit is required to support the Stage II Attitude Control Injector Unit (ACIU), replacing the NCU used on earlier models. The angular accelerometer unit shall be the same as those used on HSM-80B missiles. The Electro-Mechanical Decoder, TD-1 Instrumentation Section, Digital Data Converter D20D and the Amplifier Converter Group SE 144 shall be provided.

6.1.3 Section 43 - The R&D instrumentation section structures and equipment will be the same as flight hardware. The instrumentation subsystems included in the section are telemetry, tracking, range safety flight termination and instrumentation power.

6.1.4 Section 44 - The third stage motor for GTM 060 will have the same configuration as the first HSM-80C FTM, except for inert propellant and ordnance devices. The motor case and domes are constructed from Spiralloy wound glass. The length of the motor from datum plane to datum plane is approximately 61.8 inches and the diameter is approximately 37.5 inches. The case domes are eliptical in shape. All exterior insulation on domes and case is cork. The GTM motor propellant is inert but shall be of the same density and configuration as the FTM motor. All Ordnance Destruct System (AODS) provisions, ordnance, timer and battery are incorporated. The destruct system contains inert ordnance. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type ignition device. The third stage motor has four movable nozzles. The base heat deflector will be the same as used on the first flight missile.

6.1.5 Section 45 - Interstage II-III for GTM 060 will be of the same configuration as that used in the first flight missile. The interstage shape will be a right circular truncated cone, 39.80 inches long between datum planes. It will comprise two sections - the forward section is 23.66 inches in length and the aft section is 16.14 inches in length. The interstage will be a two-section monocoque structure with four internal rings that resist over-

pressure loads. The diameter of the interstage forward interface is 36.95 inches and the diameter of the aft interface is approximately 51.7 inches. The two sections will be joined by an internal staging ring. The internal forward and aft adaptor rings in the interstage are for mounting it between the second and third stage motors. The interstage has ordnance staging capability between the forward the aft sections. The forward section of the interstage is made up of four 90° panels with skirt removal provisions incorporated. The Safety and Arming Device shall be provided. The stage separation and skirt removal ordnance are included but they are inert. Access doors and cutouts are provided for access to the ordnance devices and for entrance of the raceway cables. The interstage skin is made of 2024-T86 aluminum alloy sheet and the circumferential rings are made of 2024-T4 aluminum. The primary exterior insulation material will be BMS-8-70 cork. Racks are provided for installation of the angular accelerometer unit and the R&D electronic equipment. R&D electronic equipment shall be provided. AODS provisions are incorporated external to the interface.

6.1.6 Section 46 - The second stage motor for GTM 060 will be identical to the first HSM-80C FTM except for inert propellant and ordnance devices. The motor case is made of titanium. The length of the motor between datum planes is 108.75 inches and the diameter is approximately 52 inches. The motor forward dome and aft closure are eliptical in shape and are made of titanium. The forward dome is not insulated; however, insulation may be used over the Attitude Control Injector Unit (ACIU) on the aft dome for radiant heat protection. The exterior insulation on the GTM motor shall be the same as the first flight missile. The GTM motor propellant is inert but shall be of the same density and configuration as the FTM motor propellant. AODS provisions, ordnance, timer and battery are incorporated. The destruct system is the same as the FTM's except for inert ordnance. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type ignition device. The second stage motor incorporates a single fixed nozzle made of refractory plastic phenolic material with a tungsten throat. The control system for this single fixed nozzle is the ACIU.

6.1.7 Section 47 - Interstage I-II for GTM 060 will be the same as for FTM 455. The interstage will be a two-section mococoque structure, the shape of a right circular truncated cone. The length between the aft and forward datum planes will be approximately 57.9 inches. The two sections will be joined by an internal transition staging ring. The internal forward and aft adaptor rings on the interstage are for mounting it between the first and second stage motors. The diameter of the interstage at the forward interface is approximately 53.3 inches and the diameter of the aft interface is 65.24 inches. The interstage structure has ordnance staging capabilities between the forward and aft sections. The forward section of the interstage is made up of four 90° panels with skirt removal provisions. The Safety and Arming Device shall be provided.

The stage separation and skirt removal ordnance are included but are inert. The aft section of the interstage will be made up of two 180° panels with a circumferential overpressure ring mounted approximately midway on the interior of the structure. Access doors and cutouts are provided for access to the ordnance devices and for entrance of the raceway cables. Material used for the interstage skin will be made of 2024-T86 aluminum alloy sheet. The overpressure ring will be 2024-T4 aluminum alloy and the material for the separation and adaptor rings is aluminum alloy. The primary insulating material shall be BMS-8-70 cork, used internally and externally. Provisions shall be made for mounting the Electro-Mechanical Decoder in the interstage and AODS externally.

6.1.8 Section 48 - The first stage motor for GTM 060 is the same configuration as the first HSM-80C FTM except for inert propellant and ordnance devices. The motor case is made of steel. The length of the motor is 222.64 inches between datum planes and approximately 66 inches in diameter. The forward dome and aft closure are steel and are eliptical in shape. The exterior insulation on the GTM shall be the same as that used on the first flight missile. The motor has four moveable nozzles. The motor propellant is inert but of the same density and configuration as that used in the FTM. AODS provisions, ordnance, timer and battery are incorporated and the destruct system for the GTM are the same as those incorporated in the FTM except that the ordnance devices are inert. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type ignition device. The base heat deflector will be the same as that used on the first flight missile.

6.1.9 Section 49 - The GTM 060 first stage skirt will be of the same configuration as that for the first flight missile. The first stage skirt structure will consist of a cylindrical monocoque forward section 11.86 inches long and a conical monocoque aft section 24.60 inches long. The two sections will be joined by an internal transition ring. The sections will be made in two halves and spliced in a manner which will allow the halves to be disassembled. Two openings will be provided in the forward cylindrical sections to provide for entry of the G&C and R&D cables. Overpressure rings will be provided internally. Material used in construction will be aluminum alloy sheet and extruded shapes. Brackets will be provided to support the G&C and R&D umbilical cable plug connections. The two halves of the first stage skirt are attached to the first stage motor by bolts. The skirt will be insulated primarily with cork per BMS-8-70, both internally and externally.

6.1.10 General

a) Raceways

The R&D and G&C raceway covers shall be located at 150° and 210° from target azimuth, respectively, measured counter-clockwise on a forward missile view. Each raceway will con-

sist of a cap on the forward end of the third stage motor, covers across the motors and interstages, and will terminate in a raceway cap on the first stage skirt. Configuration of covers and caps are determined by equipment size and shall be of minimum height. Material used in the construction will be aluminum alloy sheet and extruded shapes. Caps and covers will be primarily insulated with the BMS-8-70 cork. Brackets will be attached to the second and third stage motors to support the G&C and R&D cable staging connectors. Support of the R&D and G&C cables in the raceways across the second and third stage motors is accomplished by bracket assemblies in the raceways, spaced along the motors, and mated with the raceway attacheangles at the aft end of the second and third stage motors. The cable staging disconnect is supported by a bracket assembly mounted on the motor skirt. Support of the cable across the first stage motor is accomplished in the same manner as for HSM-80B missiles. The support of the G&C and R&D cables across the 1-2 and 2-3 interstages is similar to the method used to support the CTLI cable on HSM-80A and HSM-80B missiles. Support of the cable breakout on the forward end of the third stage motor, in the 1-2 and 2-3 interstages and the missile skirt area, is provided in the same manner as for HSM-80B missiles. Cable installation components, cable support and AODS support are provided in the G&C raceway. R&D cables, cable supports and cable installation components are provided in the R&D raceway.

b) All electrical and mechanical interfaces shall be in accordance with approved WS-133B ICDs.

c) Safety and Arming pins shall be provided for ignition safe and arm devices on all three motors.

d) External insulation ramps will not be provided and gaps will not be filled, on the GTMs.

6.2 GTM 060 Instrumentation Configuration

The AMR GTM 060 will be instrumented similar to the first AMR FTM of HSM-80C configuration. Section I of the Test Directive for GTM 060 will define the actual instrumentation requirements and is scheduled for release nine months prior to completion of missile assembly in MAB.

7.0 Vandenberg Electronic GTM Configuration

7.1 GTM Detailed Configuration

GTM 062 and GTM 063 are operational electronic missiles with Repetitive Countdown provisions incorporated and are to be used at VAFB for Assembly and Checkout, Category I and Category II testing. Each missile will be assembled at Plant 77. The Combat Training Launch Instrumentation (CTLI) components will be installed at VAFB. The configuration of these two GTMs is based upon the HSM-80C configuration. Details of the GTM configuration are as follows:

7.1.1 Section 41 - The Re-Entry Vehicle shall duplicate the first VAFB flight unit except for inert ordnance. Ordnance simulators shall be provided with the inert ordnance.

7.1.2 CTLI Wafer and Downstage Components - The CTLI Kit consisting of the wafer structure, electronic equipment, cables and wiring, raceways, cable installation and support components, timers and batteries will be identical in all respects to the HSM-80C flight components. The ordnance components of the destruct system shall be inert.

7.1.3 Section 42 and Downstage Guidance and Control Components - The Guidance and Control System to be used will be the same as operational flight hardware. A new model G&C section, cables, batteries and NCU's (for first and third stages only) will be provided. A new electronic control unit is required to support the Stage II Attitude Control Injector Unit (ACIU), replacing the NCU used on earlier models. The angular accelerometer unit shall be the same as those used on HSM-80B missiles. The Electrical Mechanical Decoder (EMD) shall be provided. In addition, a dummy third stage NCU battery is provided for the Repetitive Countdown System.

7.1.4 Section 44 - The third stage motor will be of the HSM-80C operational missile configuration except for inert propellant, inert ordnance devices, and repetitive countdown provisions. The repetitive countdown provisions in this section consist of an extender cable access hole provided by Hercules Powder Co. and the extender cable provided by Boeing. The motor case and domes are constructed from Spiralloy wound glass. The length of the motor from datum plane to datum plane is approximately 61.8 inches and the diameter is approximately 37.5 inches. The case domes are eliptical in shape. All exterior insulation on domes and case is cork. The GTM motor propellant is inert but shall be of the same density and configuration as the Operational motor. CTLI provisions are incorporated and the destruct system contains inert ordnance. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type hardware. The third stage

motor has four movable nozzles. The base heat deflector will be the same as used on the operational missile.

7.1.5 Section 45 - Interstage II-III will be of the same configuration as is used on the Operational missile. The interstage shape will be that of a right circular truncated cone, 39.80 inches long between datum planes. It will comprise two sections - the forward section is 23.66 inches in length and the aft section is 16.14 inches in length. The interstage will be a two-section monocoque structure and there will be four internal stiffner rings to resist overpressure loads. The diameter of the interstage at the forward interface is 36.95 inches and the diameter of the aft interface is approximately 51.7 inches. The two sections will be joined by an internal staging ring. The internal forward and aft adaptor rings in the interstage are for mounting it between the second and third stage motors. The interstage structure will have ordnance staging capability between the forward and aft sections. The forward section of the interstage is made up of four 90° panels with skirt removal provisions incorporated. The Safety and Arming Device shall be provided. The stage separation and skirt removal ordnance are included but they are inert. Access doors and cutouts are provided for access to the ordnance devices and for entrance of the raceway cables. The interstage skin is made of 2024-T86 aluminum alloy sheet and the circumferential rings are made of 2024-T4 aluminum. The primary exterior insulation material will be cork, BMS-8-70. A rack is provided for installation of the angular accelerometer unit. CTLI provisions are incorporated.

7.1.6 Section 46 - The second stage motor will have the same configuration as the Operational missile except for inert propellant and ordnance devices. The motor case is made of titanium. The length of the motor between datum planes is 108.75 inches and the diameter is approximately 52 inches. The motor forward dome and aft closure are eliptical in shape and are made of titanium. The forward dome is not insulated; however insulation may be used over the Attitude Control Injector Unit (ACIU) on the aft dome for radiant heat protection. The exterior insulation on the GTM motor shall be the same as the operational missile. The GTM motor propellant is inert but shall be of the same density and configuration as the Operational missile motor. CTLI provisions are incorporated and the destruct system is the same as the Operational missile except for inert ordnance. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type ignition device. The second stage motor incorporates a single fixed nozzle made of refractory plastic phenolic material with a tungsten throat. The control system for this single fixed nozzle is the ACIU.

7.1.7 Section 47 - Interstage I-II will have the same configuration as that of the Operational missile except for Repetitive Countdown (RCD) provisions. These RCD provisions consist of a Y-cable

for connection to second stage ACIU battery, an extender cable for connection to the first stage ignition safe and arm and two holes in the interstage skin to provide access to the Y-cable and the extender cable. The RCD cables and access holes are provided by Boeing., The interstage will be a two-section monocoque structure, the shape of a right circular truncated cone. The length between the aft and forward datum planes will be 57.9 inches. The two sections will be joined by an internal transition staging ring. The internal forward and aft adaptor rings on the interstage are for mounting it between the first and second stage motors. The diameter of the interstage at the forward interface is approximately 53.3 inches and the diameter of the aft interface is 65.24 inches. The interstage structure has ordnance staging capabilities between the forward and aft sections. The forward section of the interstage is made up of four 90° panels with skirt removal provisions. The Safety and Arming Device shall be provided. The stage separation and skirt removal ordnance are included but are inert. The aft section of the interstage will be made up of two 180° panels with a circumferential overpressure ring mounted approximately midway on the interior of the structure. Access doors and cut-outs are provided for access to the ordnance devices and for entrance of the raceway cables. Material used for the interstage skin will be 2024-T86 aluminum alloy sheet. The overpressure ring will be 2024-T4 aluminum alloy sheet and the material for the separation and adaptor rings is aluminum alloy. The primary insulating material will be BMS-8-70 cork, used internally and externally. CTLI and Electro-Mechanical Decoder (EMD) mounting provision shall be incorporated.

7.1.8 Section 48 - The first stage motor is the same as the operational HSM-80C first stage configuration except for inert propellant and ordnance devices. The motor case is made of steel. The length of the motor is 222.64 inches and approximately 66 inches in diameter. The forward dome and aft closure are steel and are eliptical in shape. The exterior insulation on the GTM motor shall be the same as that on the Operational missile. The motor has four movable nozzles. The motor propellant is inert but of the same density and configuration as the Operational missile. CTLI provisions are incorporated and the destruct system for the GTM are the same as the Operational equivalents except that the ordnance devices are inert. The GTM incorporates an ignition safe and arm simulator assembly instead of flight type ignition device. The base heat deflector will be the same as that incorporated on the Operational missile.

7.1.9 Section 49 - The first stage skirt will be the same as that used on the Operational missile except for incorporation of Repetitive Countdown (RCD) provisions. The RCD provisions for Section 49 consist of a Y-cable for connection to the first stage NCU battery and a hole in the skin of the skirt for access to this cable. The RCD cable and access hole is provided by Boeing. The first stage skirt structure will consist of a cylindrical monocoque forward section 11.86 inches long and a conical monocoque

aft section 24.60 inches long. The two sections will be joined by an internal transition ring. The sections will be fabricated in two halves and spliced in a manner which will allow the halves to be disassembled. An opening will be provided in the forward cylindrical sections to provide for entry of the G&C cable. Overpressure rings will be provided internally. Material used in construction will be aluminum alloy sheet and extruded shapes. A bracket will be provided to support the G&C umbilical cable plug connection. The two halves of the first stage skirt are attached to the first stage motor. The skirt will be insulated primarily with BMS-8-70 cork both internally and externally. CTLI provisions are incorporated.

7.1.10 General

a) Raceways

The G&C raceway cover shall be located at 210° from target azimuth, measured clockwise on a rear view of the missile. The raceway will consist of a cap on the forward end of the third stage motor, covers across the motors and interstages, and will terminate in a raceway cap on the first stage skirt. Configuration of covers and caps is determined by equipment size and shall be of minimum height. Material used in the construction shall be aluminum alloy sheet and extruded shapes. Caps and covers will beprimarily insulated with BMS-8-70 cork. Brackets will be attached to the second and third stage motors to support the G&C cable staging connectors. Support of the G&C cables in the raceway across the second and third stage motors is accomplished by bracket assemblies in the raceway, spaced along the motors. Support of the G&C cable in raceways across the motors is provided by foam in the same manner as on the HSM-80B missile. The G&C cable is mounted external to the I-II and II-III interstages and is supported by clamping the cable to the raceway beams in the raceway. Support of the cable breakouts on the forward end of the third stage motor, in the I-II and II-III interstages and the missile skirt area, is provided in the same manner as for the HSM-80B missiles. All seal assemblies at points of G&C cable entry are attached to the missile.

b) All electrical and mechanical interfaces shall be in accordance with approved WS-133B ICD's.

c) Safety and Arming pins shall be provided for ignition safe and arm devices for all three motors.

d) External insulation ramps will not be provided and gaps will not be filled on the GTM's.

7.2 Electronic GTM Instrumentation

The detailed instrumentation for the CTLI subsystem will be similar to the instrumentation requirements for HSM-80A and HSM-80B missiles. The requirements for these earlier model missiles are contained in D2-13306 (Reference 12). The specific instrumentation configuration for each GTM and FTM will be stated in Section I of the applicable Flight Operations Plan for VAFB.

8.0 SEATTLE GROUND TEST MISSILE CONFIGURATION

8.1 Mechanical GTM-065 Configuration

Mechanical GTM-065 representing the downstage propulsion unit will be used for the operational transportation and handling tests in Seattle. The configuration will be representative of the operational missiles, but will be assembled with Boeing components fabricated to R&D configuration and revised to simulate operational geometry. Simulated R/V and G&C body sections will be incorporated into GTM-065 during emplacement tests.

The missile will be assembled and instrumented for test at Boeing - Seattle. The instrumentation for the GTM and transportation vehicles under test is given in Table 8.1.

8.1.1 Section 41 - Re-Entry Vehicle - The physical configuration of the Re-Entry Vehicle shall be the same as described on STL Missile Profile Drawing L102304, Revision A . The R/V will be mass simulated.

8.1.2 Section 42 - Guidance and Control Section - The physical configuration of the G&C body section for GTM-065 shall be the same as that for the Operational missile. All internal equipment including electrical wiring and cabling shall be mass simulated to provide the same weight and center of gravity as the Operational G&C body section.

8.1.3 Section 44 - Stage III Motor - The Third Stage Motor for GTM-065 will be selected from one of the WS-133A GTM's. The motor propellant is inert but shall be of the same density and configuration as the operational motor. Motor nozzles, Stage III Nozzle Control Unit and base heat deflector with the motor obtained from the WS-133A program will be utilized.

8.1.4 Section 45 - Interstage II-III - The Interstage for GTM-065 will be similar to that used on GTM-060 but will have the R&D provisions deleted.

8.1.5 Section 46 - Stage II Motor - The second stage motor will be identical to the HSM-80C operational missile configuration except for inert propellant and ordnance devices. The motor case is titanium and is insulated with cork. This motor contains a single fixed nozzle. Downstage Guidance and Control during Stage II flight is accomplished by liquid injection controlled by the Attitude Control Injection Unit (ACIU). The nozzle and ACIU for GTM -065 shall be representative weight and C.G. of the operational missile. This may be accomplished by reject units or mass simulated units.

8.1.6 Section 47 - Interstage II-III - The interstage for GTM-065 will be similar to that used on GTM-060 but will have the R&D provisions deleted.

8.1.7 Section 48 - Stage I Motor - The first stage motor for GTM-065 will be selected from one of the WS-133A GTM's. The motor propellant is inert but shall be of the same density and configuration as the operational motor. Motor nozzles, Stage I Nozzle Control Unit and base heat deflector with the motor obtained from the WS-133A program will be utilized.

8.1.8 Section 49 - Stage I Skirt - The first stage skirt for GTM-065 will be similar to that used on GTM-060 but will have the R&D provisions deleted.

8.1.9 General

(a) Raceway -

The operational raceway for GTM-065 will be located at 210° from target azimuth. The raceway covers and caps will be shape simulated to represent operational contours. The raceway will extend from a cap on the forward end of the third stage motor across the motors and interstages and terminate in a cap on the first stage skirt.

(b) Mechanical interfaces for new or simulated equipment for GTM-065 shall be in accord with approved WS-133B ICD's.

Table 8.1 Seattle T&H Instrumentation

Location and Description			Range	Error	Freq Resp CPS
GTM 065 - ACCELERATION					
I Stage	Aft Dome	Vert	± 5g	5%	0-50
		Lat			
		Long			
	Top 11" Aft	Vert			
	Top 112" Aft	Vert			
	Top 215" Aft	Vert			
	Fwd Dome	Vert			
		Lat			
II Stage	Aft Dome	Vert			
		Lat			
		Long			
	Fwd Dome	Vert			
		Lat			
III Stage	Aft Dome	Vert			
		Lat			
	Fwd Dome	Vert			
		Lat			
		Long			
GTM 065 - LOAD					
Skirt	BM	Vert	500 KIP	10%	
	BM	Lat	500 KIP		
	Load	Axial	160, KP		
1-2 Interstage	BM	Vert	1,000 KIP		
	BM	Lat	1,000 KIP		
	Load	Axial	50, KP		
2-3 Interstage	BM	Vert	500 KIP		
	BM	Lat	500 KIP		
	Load	Axial	10, KP		
GTM 065 - DISPLACEMENT EDI			in/in		
Skirt Joint	Fwd	0°	±.01		
		90°			
		180°			
		270°			
1-2 Interstage	Aft	0°			
		90°			
		180°			
		270°			
	Fwd	0°			
		90°			
		180°			
		270°			

GTM 065 - DISPLACEMENT EDI (Continued)			Range	Error	Freq Resp CPS
2-3 Interstage	Aft	0°	± 0.1	10%	0-50
		90°			
		180°			
		270°			
	Fwd	0°			
		90°			
		180°			
		270°			
GTM 065 - HARNESS DEFLECTION					
1 Stage	Aft	Vert Left	± 2 in	5%	0-20
"	"	" Right			
II Stage	Aft	Vert Left			
"	"	" Right			
III Stage	Fwd	Vert Left			
"	"	" Right			
TRANSPORTER ERECTOR - ACCELERATIONS					
Over Fifth Wheel		Vert	± 25g	5%	0-50
Rear Carriage 2 Axle Left		Vert			
Rear Carriage 2 Axle Left		Long			
Hoist Container Joint		Vert	± 10g		
		Lat			
		Long			
Sta 400 Left Rail		Vert			
Sta 400 Left Rail		Lat			
Sta 800 Left Rail		Vert			
Sta 800 Left Rail		Lat			
Sta 800 Left Rail		Long			
Tractor 3 Axle Left		Vert	± 25g		
Tractor 3 Axle Left		Long			
TE - VELOCITY			in/sec		
Trailer Shock Fwd Axle Left			± 150		
Trailer Chock Fwd Axlw Right					
Tractor Shock Rear Axle Left					
Tractor Shock Rear Axle Right					
TE - LOAD			Pounds		
Restraint Strut Top Left			40,000		
Restraint Strut Top Right					
Restraint Strut Bot Left					
Restraint Strut Bot Right					
TE - DISPLACEMENT					
Trailer Fwd Axle Left - Bottoming Switch					

Location and Description			Range	Error	Freq Resp CPS
SSCBM/ACU/BMT - ACCELERATION					
SSCBM Sta 275	Left Rail	Vert	± 5g	5%	0-100
SSCBM STa 550	Left Rail	Vert	↓	↓	↓
↓	↓	Lat			
		Long	± 2g		
BMT Left Rear	SSCBM Ski	Vert	± 5g		0-50
↓	↓	Lat	± 2g		↓
		Long	± 2g		
Left Fwd	SSCBM Ski	Vert	± 5g	↓	
↓	↓	Lat	± 2g		
ACU Base Center Fwd		Vert	± 5g	10%	0-140
↓ Aft		Vert	↓	↓	↓
		Lat			
		Long			
BMT Over Fifth Wheel		Vert		5%	0-100
Rear Carriage 2 Left Axle		Vert	± 25g	↓	↓
		Long	± 25g		
SSCBM LOAD			Pounds		
Restraint Strut Top		Left	40,000	5%	0-50
↓ Top		Right	↓	↓	↓
Bot		Left			
Bot		Right			
BMT DISPLACEMENT					
Rear Carriage Fwd Axle - Bottoming Switch					0-50
C-133 AIRPLANE - ACCELERATION					
Floor Bulkhead Sta 580		Vert	5g	5%	0-50
↓ 580		Lat	↓	↓	↓
680		Vert			
914		Vert			
1020		Vert			
1020		Lat			
Center Gravity Station		Vert			
RAILCAR/ACU - ACCELERATION					
Car Floor Fifth Wheel Supt		Vert	± 5g	10%	0-50
		Long	± 10g	↓	0-100
Car Floor TE Carriage		Vert	± 5g		0-50
ACU Base Center Fwd		Vert	± 5g		0-140
↓ Aft		Vert	± 5g		0-140
Aft		Lat	± 2g		0-140
Left Aft		Long	5g	↓	0-140
RAILCAR - VELOCITY			MPH		
Velocity Before Impact			0-10	1%	—

Location and Description		Range	Error	Freq Resp CPS
RAILCAR - LOAD		K P		
Fifth Wheel Support	Vert	180	10%	0-50
Fifth Wheel Support	Diag	250	10%	0-50
RAILCAR DEFLECTION				
Shock Absorber	Long	± 20 in.	20%	0-10

9.0 UTILIZATION OF WS-133A GTM COMPONENTS

Some major components from existing HSM-80A and HSM-80B GTM's may be usable, after reqork, in building the GTM's for the WS-133B program. The possibility of reworking these components cannot be determined until the HSM-80C FTM configuration has been finalized. The reusable components are: the first and third stage engines, the skirts except for mechanical GTM 065, the G&C section for mechanical GTM 065 only, and the R&D and CTLI instrumentation sections for the electronic ground test missiles.

The presently scheduled usage of WS-133A ground test missiles shows sufficient time for rework to the HSM-80C configuration before GTM components are required on-dock. Present usage of the WS-133A GTM's is shown on Table 9.1. Availability of existing GTM's to support WS-133B programs is shown on Table 9.2.

The feasibility of reworking the usable components will have to be determined, in each case, by the responsible associate contractor. Consideration of the cost of reworking the old component to the new configuration versus the cost of fabricating a new GTM component is mandatory.

Stage I and III motors must be refurbished to the Wing VI configuration by separate contractual action with the applicable Associate Contractor before incorporation in WS-133B GTM's.

GTM006 Motors are pre-Wing I configuration and not suitable for rework. GTM 020 and 021 motors are preferred to support the HSM-80C GTM's because they are of Wing II configuration and very similar to Wing VI. GTM 008, 010, 007 motors are next in preference for rework to Wing VI configuration.

Table 9.1

GTM CONFIGURATION

GTM NO.	TYPE	LOCATION	CONFIGURATION	PRESENT USE
001	Mechanical		Dynamic Test	Dismantled
002	Mechanical		Static Test	Dismantled
003	Electronic		Parts to GTM004	Not in Existence
004	Electronic	AMR		004E-C/O FTM 417 C/O FTM 421
005	Deleted			
006	Mechanical	Seattle	Pre-Wing I	SSCFM Demonstration
007	Electronic RCD	Seattle	Wing I	C/O Wing I
008	Electronic RCD	VAFB	Wing I	C/O Wing I
009	Deleted			
010	Electronic RCD	VAFB	Wing I	C/O FTM 501
011	Deleted			
012	Mechanical – Instrumented	Seattle	Wing I	C/O Transportation

Table 9.1 (Continued)

GTM CONFIGURATION

GTM NO.	TYPE	LOCATION	CONFIGURATION	PRESENT USE
077	Electronic	Hill AFB	Plant 77-C/O FTM 501	Support Hill AFB Operations
020	Electronic	Seattle	Wing II	New Requirement
021	Electronic	VAFB	Wing II	New Requirement

Note 1; RCD = Repetitive Countdown

Note 2: For specific configuration history, see MM Program Directive No. 36.

Table 9.2

SCHEDULE OF WS-133A GTM COMPONENT AVAILABILITY TO SUPPORT WS-133B

WS-133A GTM		WS-133B GROUND TEST MISSILE REQUIREMENTS					
GTM No.	LAST USAGE	GTM NO.	DESCRIPTION	CONFIGURATION	ASSY AT	COMPONENTS ON DOCK	USED AT
004D	6-21-63	060	R&D Electronic	R&D	AMR	3-18-64	AMR
010	6-15-63	062	Electronic RCD	Operational	AFP 77	9-18-64	VAFB
008	3-1-63	063	Electronic RCD	Operational	AFP 77	12-10-64	VAFB
012	3-1-63	065	Mechanical - Instrumented	Operational	Seattle	12-3-63	Seattle

Note 1: RCD = Repetitive Countdown

Note 2: Electronic GTM's include Mechanical FTM characteristics

Note 3: All missiles are operationally configured. They are of an R&D configuration only when indicated.